

REMARKS

Applicant has reviewed and considered the Office Action mailed on September 5, 2003, and the references cited therewith.

Claims 1, 2, 3, 4, 7, 11, 17, 18, 22, 28, 29, 30 and 33 are amended, and claims 36-47 are added; as a result, claims 1-47 are now pending in this application. Please charge any required fee or refund any overpayment to deposit account 502931.

Abstract

Applicant has amended the abstract to provide proper content. Applicant does not understand the reference to chemical patent abstracts, but believes the abstract to now be in proper form. Reconsideration and withdrawal of the objection is respectfully requested.

§102 Rejection of the Claims

Claims 1-3, 16-23 and 28-30 were rejected under 35 USC § 102(b) as being anticipated by Suzuki (US 5,995,220). Applicant respectfully traverses. Suzuki describes an inspection apparatus that, according to Figure 3, obtains backlit views L1B and R1E (of the left and right rows of pins, respectively) that are from lines substantially parallel to the optical axis going up the middle of the figure from object 1 to imager 5. Suzuki also describes obtaining oblique views L1A and L1C that are not side views, but are instead are at an angle in order that the pins on the opposite side of the object do not interfere with the backlit view. This cannot provide direct information as to the side-view height of the pins (additional assumptions and calculations must be made), and is unable to detect certain defects, such as a blob of solder that is under the tip of the pin but not visible from the oblique angle (e.g., 45 degrees as shown) used for the outer oblique view. Such a defect would present the same silhouette in Suzuki's apparatus as a non-defective pin.

In contrast, the invention of the present claims, as amended, detects such a defect, which is the primary type of defect of concern, since it would prevent the pins from all reaching a single plane to be assembled to a board. This is because, in the present claimed invention, "the two or more views of the first side include a first view along a direction substantially parallel to

the primary optical axis, and a second view along a direction substantially perpendicular to the primary optical axis.” Hence claim 1 and all of its dependent claims distinguish over the cited reference. Accordingly, reconsideration of the rejection and an early indication of allowance for these claims are respectfully requested.

With regard to claim 2 as amended, this claim further distinguishes over Suzuki by reciting “on the first side of the object, there are a plurality of electrical connections each having a surface that lies along a plane, and on the second side of the object, there are a plurality of electrical connections each having a surface that lies along the plane, and wherein the second view is of the object from along a direction that is substantially parallel to the plane.” None of the views of any of the cited references is from a direction substantially parallel to the plane of pins on two sides of the object being inspected. For this reason as well as the reasons presented for claim 1, claim 2 appears to be in condition for allowance. Accordingly, reconsideration of the rejection and an early indication of allowance for these claims are respectfully requested.

With regard to claim 17 as amended, this claim further distinguishes over Suzuki by reciting “the single view is a top view of the object also showing perpendicular side views of the first side and the second side of the object.” None of the views of any of the cited references is from a direction substantially perpendicular to the top view of the object being inspected. For this reason as well as the reasons presented for claim 1, claims 17 and 18 appear to be in condition for allowance. Accordingly, reconsideration of the rejection and an early indication of allowance for these claims are respectfully requested.

With regard to claims 19-21, these claims depend on claim 7 which is not rejected under 102(b) over Suzuki, and thus a 102 rejection of these claims is improper. Accordingly, reconsideration of the rejection and an early indication of allowance for these claims are respectfully requested.

With regard to claims 22 as amended, neither Suzuki nor the other cited references provide the claimed combination “wherein the first-side view is from along a direction substantially perpendicular to the direction of the top view, and the second-side view is from along a direction substantially perpendicular to the direction of the top view.” Claim 23, 28, 29, 30 depend on claim 22. Claims 28-30 are amended to clarify, and for 28 and 29 to be different

from one another (they were formerly the same). Accordingly, reconsideration of the rejection and an early indication of allowance for these claims are respectfully requested.

Claims 31-35 were rejected under 35 USC § 102(a) as being anticipated by Chow et al. (US 6,518,997). Applicant respectfully traverses. Chow et al. show shutters 60, 62 that block a view of their pins or balls, but which are NOT illuminated on the sides facing the imager. Further, no light is imagable from that view when the respective shutter is closed, because any such light would be combined in their beam combiner 50 and would interfere with the image from the other view. Further still, Chow et al. do not image any portion of the object using back light from any illuminated surface that blocks another portion of the object. Rather, Chow et al. count on having two alternate views, from different perspectives, of the same pins or balls in order to obtain triangulation-type information. All of the balls for which height data is to be determined need to have all balls showing in both exposures (i.e., the exposures with one or the other shutter closed). Also, Chow et al. do not describe nor suggest that any illumination might be reflected towards the objects 410 being imaged (shutters are generally dull black to prevent such reflections), but even if such reflection were towards the object it would be on the side of the object facing the imager through the other shutter and would not be back light illumination, which is where the object is between the illumination and the imager along the path between the illumination and the imager.

In contrast, the present claimed invention of claim 31 recites

“blocking a first portion of the object with a first illuminated surface; and
imaging a second portion of the object using back light from the first illuminated surface.”

Hence, a *prima facie* case for anticipation has not been shown for claim 31, nor for its dependent claims. Accordingly, reconsideration of the rejection and an early indication of allowance for these claims are respectfully requested.

§103 Rejection of the Claims

Claims 4-10, 12-15 and 24-27 were rejected under 35 USC § 103 as being obvious over Suzuki (US 5,995,220) in view of Toh et al (US 6,242,756). Applicant respectfully traverses. Suzuki is described and distinguished above. Toh, provides a transparent guide 77 upon which the IC being inspected travels. Being transparent, transparent guide 77 cannot provide a divider background, since light passes through it. Further, there is no motivation to combine Suzuki with Toh et al since both use the same means to obtain non-interfering separate images of the pins on opposing sides of the object; that is they both image from oblique angles in order that the backlit image of pins on one side is not in the line of sight with pins on the opposite side of the object. Both references uses a method of not sighting the bottom of the pins from parallel to the plane at which the bottom of the pins lie, but rather sighting from an angle above or below that plane. Thus, there is no need in either reference for the suggested combination, since transparent guide 77 of Toh does not provide the background surface proposed, and Suzuki does not need a background surface because of the oblique angle of sight provided by its dove prisms.

In contrast, the present claimed invention provides such a background surface. Claim 4 and 7 have each been amended to independent form, clarifying that the background surface is non-transparent (e.g., for example translucent, diffuse, opaque, or otherwise imagable). Accordingly, claim 4 and its dependent claims 5 and 6, and claim 7 and its dependent claims 8, 9, 10, 12, 13 appear to be in condition for allowance, and reconsideration and allowance is respectfully requested.

With regard to claim 10 and 26, Applicant cannot find in the cited references any mention of spring of elastomeric material. Accordingly, reconsideration of the rejection and an early indication of allowance for these claims are respectfully requested.

Allowable Subject Matter

Claim 11 was objected to as being dependent upon a rejected base claim, but was indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claim 11 is rewritten to satisfy this requirement.

Accordingly, reconsideration of the objection and an early indication of allowance for these claims are respectfully requested.

New claims 36-47 are added to more fully describe the claimed invention. No new matter is added.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (952) 278-3501 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 502931.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 5th day of FEBRUARY, 2004.

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